Hydrogen and methane production from co-digestion of food waste and chicken manure

ABSTRACT

The production of renewable energy from agro-food waste possesses a lot of advantages over conventional methods. This study aimed at enhancing the hydrogen and methane production from co-digestion of food waste and chicken manure by adding different inoculums: aeration tank sludge (ATS), return activated sludge (RAS) and palm oil mill effluent sludge (POME). One-stage anaerobic fermentation for hydrogen and methane production was carried out in a 150 mL serum bottle at 35ºC with initial pH of 7. The effects of different combination ratios (food waste and chicken manure) were also examined. The microbial community was determined using next-generation sequencing (NGS) of 16S ribosomal RNA technique. Based on the results, the co-digestion of food waste, chicken manure using a combination ratio of 50:50 (v/v) with RAS without heat treatment gave the highest biogas yield at 120.97 NmL/g COD. The highest percentages of hydrogen and methane produced were 53.35% and 52.85%, respectively. Clostridium sp. was detected in the biohydrogen production phase with methanogens responsible for biomethane production. Thus, the heat treatment of inoculums was seen as unsuitable for producing biomethane as it inhibits methanogens.

Keyword: Co-digestion; Hydrogen; Methane; Chicken manure; Food waste; Sludge